Study of Essential Oil from Malaysian Curry Leaves

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***Abstract* —** Essential oils of *Murraya koengii* or commonly known as curry leaves' obtained from curry trees grown in the local area of Malaysia was studied. Conventional hydro distillation process was used to extract the oil from the leaves. The highest yield from the extraction is to be at 0.22% for 9 hours of extraction time. The analysis was performed using GC-MS which detects the presence of 30 different components, majorly hydrocarbons. The result shows the existing of α-pinene and β-myrcene that provides insight to the potential of using the oil as active ingredients for natural based insect repellent.

***Keywords*—**Curry leaves, essential oil, insect repellent, *Murraya koenigii*

I. Introduction

Synthetic chemicals have been widely used as the main compound in the commercial insect repellent because of the effectiveness and persistent in human skin. It functions as an active ingredient to provide vapor barrier on the surface of the skin as a protection from insect. There are several synthetic chemical compounds have been evaluated for the repellent activity but none of them have had the commercial success as N, N-diethyl-m-toluamide (DEET). To date, DEET is found to be the most efficient material that is being used as repellent, but the toxic effect cause by its application is intolerable which includes encephalopathy in children, urticarial syndrome, anaphylaxis, hypotension and decreased heart rate as well as the environment pollution risks [1]. Therefore, there has been an increase in search efforts for natural and eco-friendly repellents.

Repellent properties of several essential oil (EO) appear to be associated with the presence of mono terpenoids and sesquiterpenes [2,3]. Mono terpenes such as α-pinene, limonene, terpinolene, citronellol, citronellal, camphor and thymol are common constituents of a number of EO described in the literatures as acquiring mosquito repellent activity [4,5,6].

Among the sesquiterpenes, β-caryophyllene is the most cited to has a strong repellent against *Aedes aegypti* [2,7]. The complex mixtures of EO from several plants were found to acquire the properties against various *haemathophagous arthropods*, type of insects that consume blood as their food and some of them have been use as repellent formulation. A study on essential oil of Cymbopogon excavates plant shows that it will give 100% repellency for 2 hour duration against Anapheles arabiensis and the repellency decrease to 59.3% after 4 hours [8]. Properties of EO extracted from genus Eucalyptus are also well documented. These presented high repellent against Ixodes ricinus, Ades albopictus, Mansonia and P.humanus capitis [2,9]. Neem oil from Azadirachta indica, when formulated as 2% in coconut oil, provides a complete protection for 12 hours from Anopheles mosquitos [10].

The use of biomass, *Murraya koenigii* leaves, or called curry leaves in English and known as daun kari in Malaysia is not new, especially in South Asia and South East Asian region. The *Murraya koenigii's* tree belonging to the family rutaceae is native to India and distributed in most part of southern Asia. The leaves have a slightly pungent, bitter and feebly acidic taste, and they retain their flavor and other qualities even after drying. The leaves have been widely applied in the culinary field due to its aromatic scents and natural flavoring especially in traditional cuisines such as curries and sauces. Besides that, it was also used as medicinal purposes. In India, curry leaf are considered to be good cure against dysentery and bite of the poisonous animal. The many use of this indigenous plant also seen as a potential method to ward off insects.

In Malaysia, it is usual for the people to plant the tree at the back yard of their house which makes it more convenient for daily usage. It is believed that the folks in the rural areas of Malaysia use curry leaves as traditional home remedies for flies' prevention possibly due to the presence of chemical component in the curry leaf that have the similar characteristic to the repellent's active compound. In order to confirm this, this research work was executed as to characterize the composition existed in the essential oil of Malaysian curry leaves. This first report aims to discuss the determination of components for an essential oil of Malaysian curry leaves in finding its potential as active ingredient for natural-based insect repellent.

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II. Materials and Methods

A. Preparation of Plant Material

The curry leaves were collected from Kuantan Pahang, Malaysia from July to November, 2013. The materials were washed with water, cleaned, and stored in fresh air before used. The extraction was always carried out on freshly ground leaves.

B. Extraction of essential oils

- *Hydro distillation using conventional heating*

The fresh curry leaves was thoroughly wash using deionize water and grind using blender. Then, the grinded curry leaves were placed into 2000 ml of round flask for hydro distillation process to take place at a temperature 100°C. Each extraction process was perform with 800 ml of deionize water for a different period of extraction time ranging from 3, 4, 5, 6, 7, 8 and 9 hours. Next, the oil was separated using diethyl ether.

C. Analysis of the essential oils

In order to determine the chemical constituents of the essential oil, the extract was analyzed using a Gas chromatography-mass spectrometry (GC-MS) model Agilent 7890A GC coupled to a 5973C VL MSD Triple-Axis selective Detector available at the Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang. The GC-MS used helium as the carrier gas at constant pressure.

III. Results and Discussion

A. Influence of extraction time on the yield of the essential oil

Fig. 1 shows the percentage yield of EO obtained for a different range time of extraction 3 to 9 hours respectively. This step was performed to determine the yield of EO at different time of extraction period and finding the optimum time needed to have the highest yield. In this step, other parameters are kept constant except the time for extraction.

The results in Fig. 1 demonstrated the trend of the graph is increasing starting at 3 hour until 9 hour time. From this, it is observed that the relationship as the time for extraction is increased; the rate of extraction will also increase. The highest yield was acquired during 9 hour of extraction time with 0.22% of yield. However, as the time of extraction increased to 10 hour, the yield of the essential oil start to decrease to 0.17%. This result could possibly cause by an overexposed of the raw material (the curry leaves) to the heat that may causes the plant cell started to degrade and as consequence the essential oil is being released to the environment instead of being collected as sample.

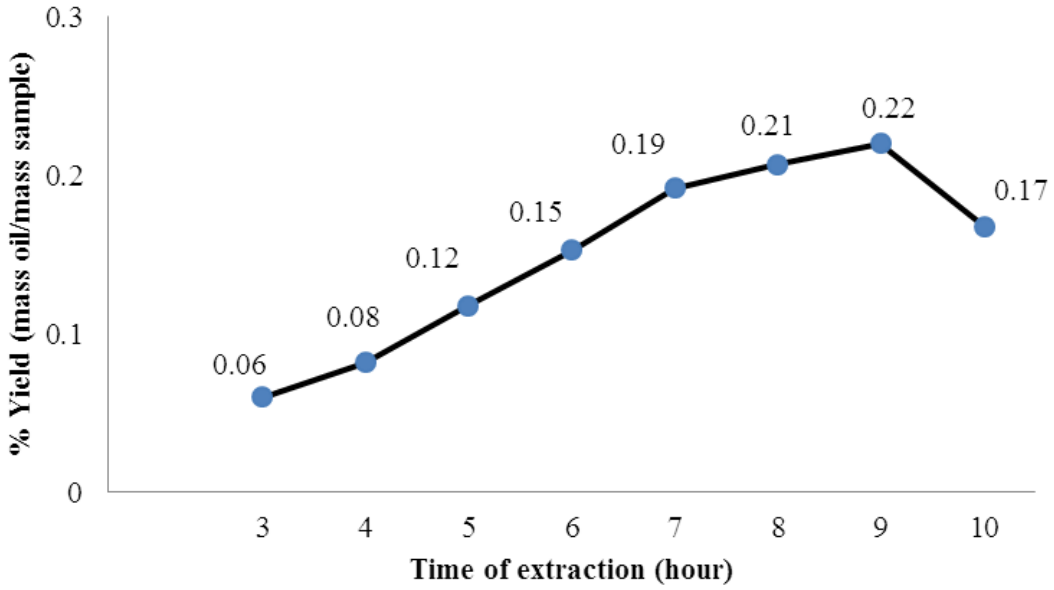

Fig. 1 Effect of the extraction time on the yield of the curry leaf essential oil

B. Compositions of curry leaf essential oil

The result from GC-MS analysis is listed in Table 1. 30 different components were obtained in the essential oil of curry leaf with the composition was dominated by the terpene hydrocarbon compound with 80%. The major components in the oil were found to be caryophyllene (32.19%), naphthalene (11.39%), globulol (10.95%), α-caryophyllene (7.29%), pentasiloxane (6.34%), cyclohexasiloxane (4.11%), 4-cyclohexylidene-n-butanol (4.39%), and α-Pinene (3.44%).

The previous study on curry leaf essential oil that grows in Malaysia [11] shows that the major constituent in the

essential oil were identify as beta-phellandrene (24.4%), alpha-pinene (17.5%), beta-caryophyllene (7.3%), terpinene-4-ol (6.1%), limonene (5.1%), gamma-terpinene (4.9%) and alpha-phellandrene (4.8%). These results show the different of the component as well as amount of the monoterpenes and sesquiterpenes that presence in the oil. The differences between this analysis and the published information may be due to botanical ambiguity, the existence of different chemical races, or differences in GC-MS setting and model for component identification.

C. Repellent activity

From Table 1, the present of small percentage of α-pinene and β-myrcene show that the essential oil of curry leaf has potential to be used as the active ingredients for natural-based insect repellent. The previous study [2,4,6] prove that some of monoterpenes such α-pinene, cineole, eugenol, limonene, terpinolene, citronellol, citronellal, camphor and thymol are common constituents in the essential oil that representing the repellent activity. A research Thorsell in 1998 [12] which study about efficacy of essential oil from various plants as mosquito repellent also show that β-myrcene compound can act as repellent for less than 1 hour referring to repellency index by USDA.

IV. Conclusion

The components contained in essential oil of Malaysian curry leaves, specifically gathered from Kuantan, Pahang was successfully investigated. The present of some repellent activity compounds in the essential oil proves its potential to be used as active ingredients in natural-based insect repellent.

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TABLE I
CHEMICAL CONSTITUENTS, RETENTION TIMES AND PERCENTAGE AREA OF CURRY LEAF ESSENTIAL OIL.

Compound	Percentage area %	Retention time
Methanethioamide	0.42	2.504
Furoxan	0.15	3.472
alpha-Pinene	3.44	4.724
Cyclobutane	0.43	6.055
beta-Phellandrene	3.91	6.056
1,3,6-Octatriene	3.39	6.323
2-Propenamide	0.24	7.040
Oxalic acid	0.99	7.238
Cyclohexasiloxane	4.11	10.645
Caryophyllene	32.19	11.640
trans-alpha-Bergamotene	1.53	11.816
beta-Myrcene	0.48	11.992
alpha-Caryophyllene	7.29	12.051
1H-Cycloprop[e]azulene	3.18	12.442
Naphthalene	11.39	12.559
alpha-Farnesene	0.34	12.666
Pentasiloxane	6.34	12.859
Hexasiloxane	1.41	12.859
7,11-Trimethyl-3-hydroxy-6,10-dodecadien-1-yl acetate	0.40	13.233
Cyclopentane	0.33	13.501
2(5H)-Furanone	0.28	13.667
Phenol	0.43	13.741
Longipinene epoxide	1.78	13.560
Globulol	2.93	13.870
4-Cyclohexylidene-n-butanol	4.39	14.292
Globulol	10.95	14.298
Benzoic acid	1.93	14.838
Pentadecanoic acid	2.30	17.106

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